BULLETIN 523 MAY, 1933

Sources of Market Milk and Butterfat in Ohio

C. G. McBride and T. K. Cowden

OHIO
AGRICULTURAL EXPERIMENT STATION
Wooster, Ohio

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C. G. McBRIDE AND T. K. COWDEN

INTRODUCTION

SOURCES OF DATA

This study is based upon a survey of the sources of milk and butterfat purchased by milk distributors and manufacturers of dairy products in the major markets of Ohio. An analysis of census data relative to milk and cream production in Ohio is also included.

The survey data were obtained in the main from three sources: (a) firms purchasing milk or butterfat direct from Ohio farms, (b) the city and district boards of health in the larger population centers, and (c) producer cooperative marketing associations engaged in the sale of milk and butterfat. The records for farms selling milk were such that it was possible to locate them by townships and they are so indicated in Figure 1. In the case of farms selling butterfat as sour cream, no records by townships were kept by the buying firms and they are, therefore, listed by counties.

The fullest cooperation was accorded those making the survey by all these agencies. Without this cooperation no such complete survey of the sources of milk and cream supplies would have been possible.

The study, insofar as the survey data are concerned, deals only with the number and location of farms selling dairy products in 1931. No attempt was made in the survey to collect data on the quantity of sales or the price received for the product sold.

The correlated analyses from census data included volume and value of sales in some instances. Census data drawn upon included the Census of Agriculture for 1910, 1920, 1925, and 1930 and the Census of Distribution for 1930.

HISTORICAL BACKGROUND—SURVEY OF 1903

A survey by mail questionnaire and correspondence of the creameries, skimming stations, and cheese factories in Ohio was made by Prof. John W. Decker of the Ohio State University for the Ohio Dairymen's Association in 1903. At that time the assembling and distribution of milk and manufactured dairy products was on an entirely different basis. There was no extensive system of farm inspection by city boards of health and the condensery and large country receiving plant had not come into prominence.

The results of this survey were published in pamphlet form as a reprint from the annual report of the Ohio Dairymen's Association for 1903. There was a striking concentration of the American cheese industry in the Western Reserve Counties and of Swiss cheese in Tuscarawas, Holmes, Coshocton, Stark, Columbiana, and Mahoning Counties. Columbiana County had eleven creameries, Ashtabula and Mahoning ten each, and Medina seven. There was

a moderate concentration of creamery development in central Ohio. The following counties had four or more creameries each: Champaign, Franklin, Knox, Licking, Logan, Muskingum, and Sandusky.

Many of the creameries maintained skimming stations at this time. There had also developed a market for whole milk for a part of the year for several of the creameries. The notation "ships some milk" occurred in connection with ten concerns on the creamery list. In addition there were listed 22 milk shipping stations.

A summary of the lists prepared by Prof. Decker gives the following totals: Butter factories, 148; skimming stations, 77; American cheese factories, 114; Swiss cheese factories, 92; a total of 431 manufacturing plants. This, combined with the 22 milk shipping stations, made a grand total of 453, distributed in 65 of the 88 counties.

SOURCES OF WHOLE MILK

Whole milk is one of the most important of all the farm products sold in Ohio. It is absorbed in three distinct outlets; namely, fresh fluid consumption, manufactured into concentrated milk products, such as condensed and evaporated milk, and manufactured into Swiss cheese.

MILK AND CREAM FOR FRESH FLUID CONSUMPTION

Whole milk in the fresh state is a highly perishable product. This, combined with the fact that extra precautions must be taken in its production and care to make it safe from a health standpoint, causes fluid milk for fresh consumption to command a higher price than does milk going into other market outlets. It is to be expected, therefore, that the strongest drawing power from a marketing standpoint upon the milk produced in a given area comes from the fluid milk agencies. The local demand for fresh milk is the first to be met. The production beyond these requirements will ultimately find its way into some manufactured product such as condensed milk, cheese, or butter.

The intimate relation of milk supply to the public health gives rise to an extensive system of inspection and to a control of the sources of milk by city and district health boards.

Areas of concentrated population.—Market movements of dairy products become closely associated with the density of city population. The state of Ohio has eight areas of pronounced concentration around the cities of Cleveland, Cincinnati, Columbus, Akron, Dayton, Toledo, Canton, and Youngstown. In addition to the milk sheds of these eight centers of population, there is a portion of the Pittsburgh milk shed in eastern Ohio. This was at one time much more extensive than the area shown in the 1931 survey. Much of the former Pittsburgh milk shed in Ohio has been transferred to Cleveland, Akron, and other cities in northeastern Ohio.

It is difficult to calculate exactly the number of farms that must be kept under board of health inspection to guarantee an adequate milk supply for any given city. In very few instances are the sales of milk dealers of a city confined wholly to the corporation limits. If, therefore, the population of the corporation only is used as a basis, the results of the board of health inspection make it appear that more farms are required per thousand population than is actually the case. On the other hand, if all the village and township population surrounding the city is included, the result is distorted in the other direction because many of these people buy milk that has not been inspected by the city.

With these limitations applying, an attempt was made to select the areas of heavy concentration of population and arrange the farms under inspection into milk sheds for these selected areas.

The groupings of cities and villages making up these centers are as follows:

1. Greater Cleveland—Cities of Cleveland, Lakewood, Cleveland Heights, East Cleveland, and 51 villages in Cuyahoga County.
2. Greater Cincinnati—Cities of Cincinnati and Norwood and 14 villages in Hamilton County.
3. City of Columbus and six villages in Franklin County.
4. Cities of Akron, Barberton, and Cuyahoga Falls and villages of Lakemore and Mogadore.
5. Cities of Dayton and Springfield.
6. City of Toledo and village of Maumee.
7. Cities of Canton, Massillon, and Alliance and villages of Louisville and North Canton.
8. Cities of Youngstown, Warren, Campbell, and Struthers and villages of Poland and Lowellville.

In Table 1 the population of these centers is given by decades for 1910 to 1930. It is evident that the demand for milk for fluid consumption was increasing rapidly during this period.

Cleveland Area.—The area served by the milk dealers whose producers are under Cleveland Board of Health inspection consists of the four cities of Cleveland, Lakewood, Cleveland Heights, and East Cleveland and some 50 villages within Cuyahoga County. As shown in Table 1 this comprised a milk purchasing population of 1,196,727 in 1930.

TABLE 1.—Large Centers of Population in Ohio Based on Census of 1930, 1920, and 1910

Area	1930	1920	1910
Greater Cleveland	1,196,727	936,552	633,117
Greater Cincinnati	537,860	460,314	403,915
Columbus and villages	310,892	242,427	183,317
Akron, Barberton, and villages	301,943	238,197	82,935
Dayton and Springfield	269,725	223,399	163,498
Toledo and Maumee	295,306	246,359	170,804
Canton, Massillon, and Alliance	160,131	129,807	81,722
Youngstown, Warren, and villages	240,504	179,267	100,448
Total	3,313,088	2,656,322	1,819,756

The Cleveland Board of Health at the time this survey was made had three distinct classes of farms under inspection; namely, approved dairies which reached a score of 75 or more in the scoring system used, dairies meeting the minimum inspection requirements but not carrying approved dairy certificates, and farms meeting the requirements for production of sweet cream for sale in the city fresh cream trade. These classifications are listed by counties in Table 2.

During recent years many plants formerly holding cream permits have met the requirements to sell fluid milk on the Cleveland markets. In May 1931 there were six plants located in Ohio whose producers were under Cleveland cream inspection. However, there are several other plants with permits to sell cream, whose producers are under some other city's inspection.

TABLE 2.—Farms Under Cleveland Milk and Cream Inspection

By counties, May 1931

County	Regular inspection	Approved dairies	Cream inspection	Total inspection
Allen			43	43
Ashland	314	67		381
Ashtabula	1163	236		1399
Auglaize			23	23
Carroll	47			47
Champaign			628	628
Clark			86	86
Columbiana	230	17		247
Coshocton	42	12		54
Crawford	56	12		68
Cuyahoga	167	40		207
Delaware			14	14
Erie	81	12		93
Fulton			50	50
Geauga	1046	263		1309
Hancock	103			103
Henry	19			19
Holmes	201	124		325
Huron	423	86		509
Knox	40		22	62
Lake	66	49		115
Licking		2	128	130
Logan	96		203	299
Lorain	916	325		1241
Mahoning	133	22		155
Marion			44	44
Medina	954	162		1116
Miami			120	120
Montgomery			1	1
Morrow	4		14	18
Ottawa	65			65
Perry			2	2
Portage	650	138		788
Putnam			15	15
Richland	58		27	85
Sandusky	419			419
Seneca	180			180
Shelby			202	202
Stark	37	1		38
Summit	144	61		205
Trumbull	69	106		175
Tuscarawas	325			325
Union	85		62	147
Wayne	368	256	1	625
Wood	237			237
Wyandot	20	1		21
Pennsylvania	497	45		542
Total	9,255	2,037	1,685	12,977

In addition, several plants were under inspection for the sale of manufactured dairy products only. The producers of these plants are not included in the tables and maps showing farms under inspection for the Cleveland milk and cream supplies.

The milk from farms under inspection reaches Cleveland, in part, by direct haul in trucks from the farms to city plants and, in part, from plants outside the city. Three types of outside plants are engaged in handling milk and cream in this manner: (a) Country cooling stations, (b) manufacturing plants selling a part of their receipts in Cleveland, and (c) milk distributing plants in cities and towns within the milk shed that sell either regularly or at times in Cleveland.

All three of these types place all of their producers under inspection, but it is obvious that not all of the milk purchased is marketed in Cleveland. The total number of farms recorded in the survey as under Cleveland inspection

was 12,977, of which 542 were located in Pennsylvania. This divided into 1,196,727, the population of the area, gives a figure of 92.2 persons for each farm under inspection. This is lower than that of the other areas because of the division of the total purchases between use in Cleveland fluid trade and the uses mentioned above.

Cleveland inspection in May 1931 reached into 46 of the 88 counties of Ohio. The permits in Shelby, Logan, Union, Champaign, Clark, and Licking Counties were chiefly for sweet cream. Some farms in west central Ohio that had been under this class of inspection were dropped a short time preceding the survey.

Cleveland, like most other large cities, is located on a water front. This makes it necessary to extend the milk shed farther than is necessary for an inland city with the same type of farms surrounding it.

Ashtabula, Geauga, Portage, Medina, and Lorain Counties have 47.1 per cent of the 12,435 farms located in Ohio under Cleveland inspection. The city draws nearly one-half of its milk supply from these five counties, and yet it maintains inspection in 41 other counties of this State and several in other states in order to secure the remainder of its supply.

Until 1925 practically all the milk from Ashtabula and Trumbull Counties, except that needed for local consumption, was controlled by Pittsburgh dealers through a string of country plants. In 1925, truck routes began to appear for transportation of milk to Cleveland. In 1929, six Pittsburgh country plants were transferred to the Cleveland market. These shifts came as the result of the change from rail to truck transportation and the increasing demand for milk in Cleveland.

The Cleveland market is noted for its large number of milk dealers. At the time of the survey there were 131 pasteurizing plants with permits to sell in Cleveland and its suburbs. This complicates the problem of securing the city's supply from the producers and makes difficult the problem of adjusting the milk shed to the varying demands of the market.

The boundaries of the Cleveland milk shed and the status of the various classes of inspected producers have been changing rapidly in the past few years. Manufacturing plants have placed increasing quantities of fresh milk on the market. Several Swiss cheese plants in Tuscarawas County were purchased by a Cleveland firm and replaced by a cooling plant to prepare milk for the fluid market. At the time of the survey the demand for milk had begun to slow down, but no marked contraction of the milk shed was evident.

Cincinnati.—The location of Cincinnati gives it the distinction of drawing heavily upon three states for its milk supply. In the survey no effort was made to secure the number and locations of farms in Kentucky and Indiana that supply milk to the city.

Cincinnati distributors also serve some trade in Covington, Kentucky, and Hamilton, Ohio. One of the largest distributing concerns has a plant in Hamilton in which most of the milk received goes into manufacturing channels, but all the producers are under inspection of the city of Cincinnati.

Several years ago Cincinnati firms had a number of country plants in which milk was assembled before coming into the city. These have been abandoned and all milk now comes direct to the city by truck.

Farms in Ohio under inspection are listed by counties in Table 3.

TABLE 3.—Ohio Farms Under Cincinnati Board of Health Inspection

By counties, 1931

County	No. farms	County	No. farms	County	No. farms
Brown	62	Clinton	454	Highland	49
Butler	931	Greene	13	Montgomery	44
Clermont	349	Hamilton	454	Preble	374
				Total	2730

Columbus.—The city of Columbus is the most completely isolated of the markets studied. The milk shed comprises counties that produce large quantities of milk which goes into manufacture of condensed milk and milk powder. The producers of one of these manufacturing plants located in Columbus were almost all under inspection by the Columbus Board of Health at the time this survey was made, and those not under inspection were being put under as rapidly as possible.

The records made it possible to divide the producers into two classes—those under inspection for sale of fluid milk in Columbus and those under inspection for sale at the manufacturing plant. These farms are listed by counties in Table 4.

TABLE 4.—Farms Under Inspection by City of Columbus

By counties, 1931

County	Under inspection for fluid sales (Farms)	Under inspection for manufacture (Farms)	Total inspection (Farms)
Champaign	.....	43	43
Clark	.....	25	25
Delaware	579	275	854
Franklin	643	185	828
Fairfield	60	30	90
Fayette	.....	148	148
Knox	7	.....	7
Licking	571	104	675
Madison	99	201	300
Morrow	.....	57	57
Pickaway	25	145	170
Union	214	149	363
Total	2198	1362	3560

At this time the product under inspection for manufacture in Columbus is not available for sale as fresh fluid milk in the city trade. When all the producers are brought under inspection this milk will become a potential supply for this purpose.

Akron.—The Akron area, like that of Cleveland, consists of a group of cities and villages. Although it is more definitely concentrated than is Cleveland, it has many of the characteristics of that area. A comparison of the population in the three census periods discloses the most rapid growth of all the areas in the past 20 years.

Four counties—Medina, Wayne, Portage, and Summit—furnish 74 per cent of the supply under Akron inspection. The distribution of farms by

counties is shown in Table 5. The map shows it to be distinctly oblong or oval in shape. This is due to competition of Cleveland on the northwest and Canton on the southeast.

TABLE 5.—Farms Under the Akron Board of Health Inspection

By counties, June 1931

County	No. farms	County	No. farms
Ashland	3	Portage	777
Coshocton	14	Stark	300
Delaware	117	Summit	381
Geauga	17	Tuscarawas	61
Holmes	253	Union	52
Marion	79	Wayne	998
Medina	405		
Morrow	7	Total	3464

The city of Akron maintains inspection on the producers of two manufacturing plants—the Orrville condensery and a plant of the Westerville Creamery Company at Prospect in Delaware County. The Orrville Milk Condensing Company, by contract with the Summit County Milk Producers Association and the Akron milk dealers, acts as a stabilizer for the Akron market. The agreement provides that the condensery absorb a certain volume of the surplus from the fluid market and supply the dealers with milk to meet shortages if and when they occur. The condensery also sells some fluid milk in Cleveland.

Dayton and Springfield.—These two cities maintain separate inspection, but in many ways they are closely related. The Miami Valley Milk Producers Cooperative Association sells the organized milk in both markets but on slightly different marketing plans.

Clark, Greene, and Montgomery Counties together contain more than three-fourths of the farms under inspection for these markets. The distribution of farms by counties is given in Table 6.

TABLE 6.—Farms Under Inspection by Dayton and Springfield Boards of Health

County	Dayton	Springfield	Total
	Farms	*Farms*	
Clark	33	552	585
Clinton	2	.....	2
Darke	34	.....	34
Greene	569	31	600
Madison	.....	13	13
Miami	222	4	226
Montgomery	757	.....	757
Preble	86	.....	86
Warren	70	.....	70
Total	1773	600	2373

There are manufacturing plants in the area under permit to sell cream in the Cleveland market, and this serves as a stabilizing influence upon the local market situation. At any time that more milk is needed for the city supply in either Dayton or Springfield it can be readily obtained. The demand for butterfat is also quite keen in this area. Many grain and hog farmers prefer selling butterfat so they may have the skimmilk for farm feeding.

Toledo.—Toledo is located on the edge of a large area devoted to the production of milk for condenseries. There is, therefore, at all times an unlimited supply close at hand. In 1931 approximately one-third of the farms under city inspection was located in Michigan.

There were 17 milk dealers under Board of Health inspection. Over 68 per cent of the producers under inspection sold to the three leading dealers in the city.

A large dairy company operating several plants in this territory acts as a stabilizer for the Toledo fluid market. Large quantities of cream are shipped to eastern markets by this company. Any increase in demand for milk in Toledo can very readily be met by converting farms from condensery to city channels.

The location of Ohio shippers to this market is given in Table 7.

TABLE 7.—Farms in Ohio Under Inspection by Toledo Board of Health

County	No. farms	County	No. farms
Fulton	278	Sandusky	198
Lucas	296	Wood	728
Ottawa	260	Total	1760

Canton, Massillon, and Alliance.—These cities are all located in Stark County and in many ways have the aspect of a single market. The organized milk in all three cities is sold by the Stark County Milk Producers Association.

The milk sheds of Akron, Cleveland, and Pittsburgh surround this area. It is also adjacent to the Swiss cheese territory.

Of the 1237 producers of this area 1015, or 82 per cent, are located in Stark County. The distribution of farms under inspection by counties is given in Table 8.

TABLE 8.—Farms Under Inspection for Canton, Massillon, and Alliance

County	No. farms	County	No. farms
Carroll	26	Summit	1
Columbiana	53	Tuscarawas	55
Mahoning	33	Wayne	53
Portage	1		
Stark	1015	Total	1237

Youngstown and Warren.—These market areas are under the inspection of their respective boards of health, but they are very closely connected with the Pittsburgh market because the same producers' sales organization sells the milk of its members in all these markets. In the main, surplus over the local requirements is diverted into the country plants sending fluid milk into Pittsburgh.

The farms under inspection by counties are as follows: Trumbull 691, Mahoning 783, Columbiana 316, and Portage 45. Of the 245 farms under inspection by the Warren Board of Health, all except two were in Trumbull County.

Pittsburgh Area in Ohio.—At one time Ohio furnished over one-third of the milk supply for the Pittsburgh market. The rapid growth of the cities in northeastern Ohio has afforded outlets for Ohio milk closer at home. Using the average of one dairy for each 94 city inhabitants, Ohio is now drawn upon to furnish about one-fifth of the milk requirements for Allegheny County. This decline may be partly accounted for by the great increase in dairy production in the counties within an hour's trucking time of Pittsburgh. Some territories in southwestern Pennsylvania have changed from sheep raising to dairying within the last 15 years.

With the rapid growth of population in Pittsburgh and the adjacent industrial territory in the decade 1900-1910 there was need for expansion in milk shed. Pittsburgh milk dealers came into Ashtabula and Trumbull Counties because of the intensity of dairying and the convenient rail transportation into the city. At the height of this development there were about 20 country plants receiving milk for the Pittsburgh market.

In the last few years there has been a marked decrease in the number of plants in Ohio under Pittsburgh inspection. Some of the plants have absorbed the territory formerly served by two or more plants. Other producers have been dropped from city inspection altogether. Six plants formerly under Pittsburgh inspection were transferred to Cleveland in 1929. The plants transferred were located at Austinburg, Rome, Jefferson, Windsor, Dorset, and Rock Creek, Ohio.

In 1931, Pittsburgh maintained inspection over six Ohio country milk plants located at Lockwood, Farmdale, Mesopotamia, East Rochester, Andover, and Barnesville, Ohio. Some of the plants are looked upon only as a market reserve for the city. Table 9 shows the location of the farms in Ohio that are under Pittsburgh inspection.

TABLE 9.—Farms in Ohio Under Inspection by Pittsburgh Board of Health, 1931

County	No. farms	County	No. farms
Ashtabula	314	Monroe	58
Belmont	449	Noble	58
Carroll	84	Stark	12
Columbiana	81	Trumbull	566
Geauga	16		
Guernsey	112	Total	1750

Trends of production within a 40-mile radius of Pittsburgh seem to indicate that the city will be able to draw an increasing amount of milk from that territory. Several factors contribute to the situation: 1. Profits derived from beef cattle and sheep raising in the territory have declined. 2. Because of the depressed condition of the soft coal industry many men have bought or rented cheap land and are now dairying. The foreigner with his large family is in a position to maintain a good sized herd of dairy cows. 3. About two generations have lived on these farms and spent the money derived from the sale of coal and oil leases. It will be necessary for the next generation to be more productive in order to maintain the present standard of living.

The counties in southwestern Pennsylvania will probably make a stronger bid for Ohio's hold on the Pittsburgh fluid milk market in the future than in the past.

In Figure 1 is given a composite picture of locations of farms under inspection by the boards of health in the nine centers described above. Space did not permit the inclusion of a milk shed map for each market. It should be borne in mind that this is not a map of all farms under city inspection in Ohio. It includes only the eight Ohio centers of population and Pittsburgh as indicated on Page 4. Some over-statement results from the effort to locate shippers by townships. A single character represents 15 farms, or in a few instances in border townships less than 15.

Fig. 1.—Farms under board of health inspection of Cleveland, Akron, Toledo, Canton, Massillon, Alliance, Youngstown, Warren, Columbus, Dayton, Springfield, Cincinnati, and Pittsburgh. (Each character represents 15 farms or in outlying townships less).

Ratios of population to farms under inspection.—From the above records of farms under inspection and the 1930 Census of Population, it is possible to compute a ratio of population served to inspected farms for each of the Ohio

markets. These ratios are given in Table 10. The number of people in the city to each farm inspected varies from 74.7 in Cincinnati to 131.1 in Youngstown and Warren. The weighted average of all markets is 93.8.

Two important factors influence this figure; namely, size of farms and the amount of inspected milk going into uses other than fresh milk consumption. A third, but within this group a less variable factor, is the per capita consumption of fresh milk.

TABLE 10.—Ratio of Population Served by Milk Dealers to Farms Under Board of Health Inspection in Eight Population Centers, 1930-1931

	1930 population	Farms	Ratio of population to farm
Cleveland	1,196,727	12,977	92.2
Cincinnati	537,860	7,200	74.7
Columbus	310,892	3,560	87.3
Akron	301,943	3,464	87.2
Dayton and Springfield	269,725	2,373	113.2
Toledo	295,306	2,630	112.3
Canton, Massillon, and Alliance	160,131	1,237	129.5
Youngstown and Warren	240,504	1,835	131.1
Total	3,313,088	35,276	93.9

The fact that Cleveland, Cincinnati, Columbus, and Akron all have large manufacturing plants whose entire patronage is under inspection accounts for the lower ratios of these markets. In the Cincinnati milk shed the dairy farms are smaller than in the other three and this further reduces the ratio. The average of the four remaining markets is 121 people per farm. Larger farms in some instances and the lack of a large reserve of milk for manufacturing purposes accounts for this difference. From these computations it would appear that any Ohio market which, under the production and consumption schedules prevailing in 1931, had one farm under inspection for each one hundred of population in the area served by dealers was adequately provided with a milk supply.

Geographical limitations of milk shed boundaries.—A combination of economic factors has centered attention upon the feasibility of setting definite limits to city milk sheds. During the period 1925 to 1928 industrial conditions were good in Ohio cities, and it appeared as though production in the established milk sheds might not keep pace with city demand. At this time prices for milk going into manufacturing outlets were such that this milk could be purchased at a relatively good price and carry the trucking charges then in effect. This combination of factors induced dealers to enlarge their receipts considerably beyond actual needs for fresh milk and cream for fluid distribution.

With the crash in prices in 1929 and the decline in industrial activity in the cities a new set of conditions developed. Milk for manufacture declined very sharply in price, making it unprofitable for the farmer to deliver it into the city at a price the dealer could afford to pay. City population declined and consumption per capita was also affected. The competition of canned milk became more intense.

In the country changes were also taking place. The cow cycle was still in the increasing stage. The prices of grains declined faster than that of milk

and thus at declining prices there was not a corresponding decline in volume of farm sales. In some markets farmers who had been selling sour cream were asking to be put under inspection.

Combined with these disturbing influences new dealers came into all of the markets studied. Many of them secured their milk from sources outside the producers' organization which had been selling to the established dealers. In some instances this meant adding new territory to the milk shed.

As a result of these disturbing influences, there has grown a definite desire on the part of the older firms and the producer association leadership for some geographical limitation of milk shed boundaries. City boards of health have to face reduced budgets in most cities and they have not been inclined to expand their operations much beyond the requirements of an adequate milk supply.

The most definite move to establish geographical boundaries by city legislation was made in Akron. Here the council passed an ordinance providing that free inspection of farms would not be made beyond a 60-mile radius of the city and that no pasteurizing plants would be inspected beyond 10 miles of the city limits. An inspection charge was provided for those outside the corporation limits but within the 10-mile zone. The Division of Health and City Council believed that this was sound legislation both from the standpoint of protecting the health of the city and from that of economical city administration. At this time the ordinance is being tested in the courts.

The added burden of transportation costs on low priced milk lying at the greatest distance from the city should operate to cause its withdrawal from the market under existing conditions. This process of adjustment is imperfect for several reasons. The farmer who has once been admitted to a city market is reluctant to give up that privilege. He will continue selling at a loss in order to maintain his status as a fluid milk shipper. In many cases trucking charges are not accurately adjusted to distances hauled and the outlying shipper has a relative advantage.

The control of these factors so as to maintain a reasonable degree of market stability is the most difficult problem facing the fresh milk industry at this time.

MILK FOR MANUFACTURE INTO CONCENTRATED MILK PRODUCTS

There was not a sharp line of demarcation in 1931 in Ohio between milk under inspection for consumption as fresh milk and that sold to condensing and evaporating plants. There were some cases in which all the milk purchased by a given plant went into fluid channels as fresh milk and others in which all milk handled was manufactured. There was also a large number of plants whose producers were under city inspection but whose outlets were divided between the two uses. In Figure 2 is given the location of farms selling to manufacturing plants whose producers are not under inspection of any local city. Pittsburgh is considered as a local city and its farms under inspection are included with those of Ohio cities. Those plants with all producers under inspection of an Ohio city or Pittsburgh have been recorded in the fresh milk classification of the preceding section. They are omitted from this section to avoid duplication.

Three Ohio manufacturing plants were under the inspection of some out-of-state city other than Pittsburgh. The producers for the Walgreen Drug Company plant at Holgate were under Chicago inspection. The Holgate plant maintains this inspection in order to supply the Walgreen Drug Stores in Chicago with cream, ice cream mix, and various dairy products. The producers of the Conestoga Cheese Company at Lima met the cream and cheese requirements of Newark, New Jersey, inspection. The Page Dairy Company plant at Bluffton, Ohio, was also under the inspection of Newark, New Jersey.

Fig. 2.—Location of uninspected farms, by townships, selling milk to manufacturing plants located in northern Ohio

The farms selling to the manufacturing plants under the inspection of these cities are not shown on a separate map. These farms are included in the manufacturing group. Several of the manufacturing plants are sending large quantities of sweet cream into cities that do not require farm inspection for cream sources.

There is a striking concentration of manufacturing plants in northwestern Ohio. This is due in the main to two reasons: 1. The manufacturing plants located in the remaining sections of the State have for some time had their producers under inspection of Ohio cities for reasons already given. 2. North-

western Ohio is an area well adapted to the production of milk in large quantities and is practically outside the heavy drawing area of the large population centers of the State.

On the basis of present numbers of city inhabitants per dairy under inspection, there are enough dairies selling fluid milk to manufacturing plants in northwestern Ohio to supply the milk requirements of a city the size of Cleveland; 39.4 per cent of these farms are concentrated in Williams, Fulton, Henry, Putnam, and Mercer Counties.

Several of the plants in this territory require their milk to be produced under conditions that would compare favorably with most city inspection. In some cases where the milk is made into baby food the inspection requirements are more strict than those for fluid consumption in cities.

There has been a rapid increase in the manufacturing of milk in this territory within the past 10 years. Intense competition has arisen among the various plants for milk supplies. The manager of a plant located in this area reports that five new agencies have entered his territory within the last 7 years.

The plants in northwestern Ohio are manufacturing practically all types of dairy products. Plants condensing or evaporating milk are the more prominent. Their product is largely shipped in carlots to eastern markets. A large quantity of various forms of powdered milk is manufactured each year. Two large cheese factories operate in this territory. Several plants devote part of their operations to the manufacture of a highly specialized baby food—another to the manufacture of a malted milk powder. One of the smaller concerns specializes in a bottled chocolate milk drink.

For the most part, the farms selling to these plants are located at distances that make trucking charges low compared with those prevailing on the longer hauls to the city plants. In times of falling prices this is a distinct advantage to the manufacturing plant because trucking rates do not fall as rapidly as milk prices. The result is that the trucking charge becomes a very heavy burden upon city supplies lying at the greatest distances from the point of consumption.

MILK FOR MANUFACTURE OF SWISS CHEESE

A separate classification is made for the milk going into the manufacture of Swiss cheese because of the localized and distinctive character of the industry.

Swiss cheese making in Ohio has always been on a small factory basis. Formerly it occupied a position of much greater relative importance in northeastern Ohio as shown in the survey of 1903. The report of the Ohio Dairymen's Association for 1914 recorded 97 cheese factories, including both Swiss and American. They received the product of 2538 farms with 21,776 cows.

The survey of 1931 found 27 factories concentrated in the Holmes-Tuscarawas-Wayne-Coshocton area. Two were started that year in northeastern Stark County on the edge of the Canton milk shed and one isolated factory was found in Monroe County.

In Figure 3 and the legend attached is shown the location of all factories except the one in Monroe County. Originally all the farms sending milk to the Swiss cheese factories were without city inspection. In the past 5 years many of these farms have been placed under the inspection of Cleveland, Akron, or Canton. The 1931 survey gave a total of 882 uninspected farms and

approximately 100 inspected farms going into the factories in the flush period of production. The average is slightly over 30 farms to a factory. For the season of 1931 approximately 38,000,000 pounds of milk went into the manufacture of Swiss cheese.

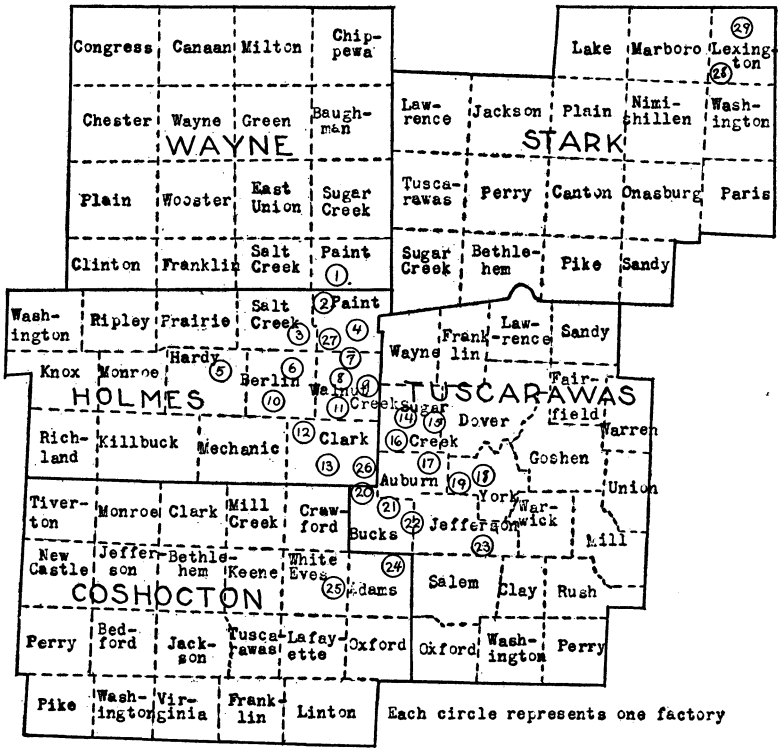

Fig. 3.—Swiss cheese area of Ohio in 1931

1. Yoder
2. Ashley Cheese Co.
3. Mt. Hope
4. Winesburg
5. Honey Run
6. Bunker Hill
7. Trail
8. Hersberger
9. Gerber Valley
10. E. J. Miller
11. Mast
12. Charm
13. Farmerstown
14. Sugar Creek
15. Number Seven
16. Union Cheese Co.
17. Wyss
18. Yorktown
19. Champion
20. Baltic
21. Fiat
22. Telling Belle Vernon-Crooked Run
23. Lantzer
24. Bakersville
25. Pearl
26. N. E. Miller
27. Lower Trail
28. Biery Cheese Co.
29. Lugenbuhl

The operations of the factories vary according to conditions on the city fluid milk markets. During periods of surplus on the markets, the manufacture of Swiss cheese is greatly increased. Large quantities of milk normally going into Cleveland, Akron, and Youngstown are made into Swiss cheese by these factories. When a shortage appears this territory is one of the first to be drawn upon to meet market demands. Due to this fact the Swiss cheese industry has been somewhat unsettled during the last decade.

As the city milk dealers have entered the Swiss cheese territory some of the larger companies have purchased the Swiss cheese factories outright. The factories are operated as a cooling station during the periods when milk is needed on the city markets. When the cities have a surplus, the milk is made into Swiss cheese. By this arrangement the city milk dealers use the Swiss cheese factories as a stabilizer for their market.

In some cases the city dealers have arrangements with various cheese factories to manufacture their surplus milk. The cheese factories are privately owned and manufacture for these dealers on a contract basis.

The dairymen selling to the cheese factories are large producers of high quality milk. However, the majority of these dairies produce most of their milk during the summer months.

During the summer of 1931 a larger volume of milk found its way into the manufacture of Swiss cheese than had been the case for many years. Fluid milk prices were lower due to the depressed industrial conditions. The fluid milk from this territory must bear relatively high transportation charges before reaching fluid markets. It is possible that the price advantage for this territory may swing back toward the cheese factory outlets during the period of lower city demand. However, over a period of years the trend will undoubtedly be toward market milk.

SOURCES OF BUTTERFAT FOR THE MANUFACTURE OF BUTTER

The butter industry in Ohio is one of the oldest and has always been one of the most important. Before the invention of the centrifugal separator butter making was a home industry. The first factories to be established received the whole milk, separated it, and returned the skimmilk to the farmer. As their operations extended beyond the practical limits of horse and wagon hauling of whole milk, skimming stations came into existence. In these the milk was assembled for skimming, and the cream only was transported to the factory.

With the general introduction of the farm separator there came into existence the cream station and the cream route. Another invention, the Babcock test, made the purchase of cream on this basis feasible. The cream route is not a new marketing method in Ohio. In the early days of creamery history "bucket routes" were run by some plants. On this type of route the cream was sampled at the farm and dumped into a large container on the wagon of the hauler.

This survey involved the three important types of agencies buying butterfat: (a) The large centralizing creamery, which reached out over a wide area for supplies; (b) the small community creamery, usually cooperatively owned and serving a limited area; and (c) the city milk plant which made some butter from sour cream coming directly from farms.

It was more difficult to obtain accurate and exact information upon the location of farms selling cream than of those selling whole milk. No such detailed records as are found of farms under board of health inspection are kept by the butter manufacturers. In all instances the firms visited made available the records they had. The county totals computed from the survey have been checked against the corresponding figures of the 1930 Census and the slight variations of the two indicate that the survey records rate high in accuracy.

CHURNING POINTS COVERED IN SURVEY

The movement of cream from any given county is greatly influenced by the location of churning points. In Table 11 the churning points covered in the survey are shown. It is significant that they are concentrated to a marked degree in the central and west central counties of the State. The factories in the eastern part of the State are for the most part relatively small. The larger centralizing operations with three or four exceptions are in the central group.

TABLE 11.—Churning Points Visited in the Survey

Akron	Cleveland	Kenton	Oak Harbor
Anna	Columbus	Lima	Ohio City
Arcadia	Coshocton	London	Orrville
Ashland	Covington	Loudonville	Petersburg
Batavia	Crestline	McConnelsville	Pickerington
Beallsville	Dayton	Mansfield	Piqua
Belle Center	Defiance	Marietta	Powhatan Point
Bellefontaine	Delphos	Marion	Quaker City
Bryan	Findlay	Montpelier	Springfield
Bucyrus	Fort Recovery	Morenci	Tiffin
Caldwell	Fostoria	Mount Vernon	Toledo
Canton	Gibsonburg	Napoleon	Upper Sandusky
Cincinnati	Greenville	New Bremen	Wapakoneta
Circleville	Hannibal	Newcomerstown	Washington C. H.
Clarington	Jackson Center	Newark	Woodville

METHODS OF ASSEMBLING

Sour cream, or butterfat as it is more commonly designated in the trade, is assembled for manufacture by three methods:

(a) Cream stations.
(b) Direct delivery to the plant.
(c) Cream routes.

Most concerns in Ohio use two of the three methods; many in 1931 were using all three.

There is some overlapping of methods and some confusion of terms. In this study an assembling agency was designated as a cream station when cream was brought into it by the farmer to be handled from that point by the station operator or some representative of the buying firm. Some companies distinguish between regular stations and "set-in" stations. The operator of a set-in station does not test the cream and pay the producer at the time of delivery. This set-in cream is usually picked up by a trucker who may also be picking up cream from farmers. In these records farmers selling through set-in stations are classified as station patrons.

The term "direct delivery" is used to apply both to the farmers who shipped their cream direct to the plant and to those who delivered it to the plant themselves. It does not include patrons of creameries who are on what is called "direct shipper routes".

Route cream is here defined as that cream coming from the farm to the plant by truck. The method of assembling is the distinguishing factor, not the method of paying for the cream. In some instances the truck cream is bought on a station basis and in others it is purchased on what is known as the direct shipper route basis. No effort was made to divide the cream into these latter classifications.

Cream stations.—A total of 1502 cream stations was recorded in the survey. The records were secured from the purchasing firms. The patrons per station were calculated in various ways. In some cases station shipping records were examined; some were estimated from the number of cans received weekly; and some were obtained by direct contact with the station manager. The summary of stations and patrons by counties is given in Table 12. The average number of patrons per station was 35.7. In Figure 4 the location of cream stations in the summer of 1931 is shown.

TABLE 12.—Distribution of Farms on Basis of Methods of Assembling of Sour Cream or Butterfat

By counties, 1930

County	No. of cream stations	Farms selling through cream stations	Farms selling direct	Farms selling on truck routes	Total farms selling sour cream
Adams	24	1229	55	419	1703
Allen	28	1213	74	343	1630
Ashland	10	490	615	50	1155
Ashtabula	1	30	80	.....	110
Athens	18	616	379	60	1055
Auglaize	18	477	390	685	1552
Belmont	6	266	171	53	490
Brown	46	1600	25	577	2202
Butler	11	339	37	256	632
Carroll	9	437	193	180	810
Champaign	29	978	92	88	1158
Clark	13	476	25	380	881
Clermont	20	609	30	868	1507
Clinton	21	635	70	495	1200
Columbiana	3	90	320	.....	410
Coshocton	22	720	690	.....	1410
Crawford	26	980	278	350	1608
Cuyahoga	.....	.....	16	.....	16
Darke	61	1791	203	944	2938
Defiance	8	320	614	.....	934
Delaware	17	550	16	135	701
Erie	2	150	85	.....	235
Fairfield	25	1061	55	791	1907
Fayette	12	351	12	357	720
Franklin	2	54	30	530	614
Fulton	10	300	225	30	555
Gallia	12	1330	109	60	1499
Geauga	.....	.....	62	.....	62
Green	16	543	13	171	727
Guernsey	25	967	577	15	1559
Hamilton	3	50	20	225	295
Hancock	29	1180	516	9	1705
Hardin	42	1260	16	66	1342
Harrison	11	495	57	154	706
Henry	12	420	454	15	889
Highland	45	1072	155	706	1933
Hocking	10	355	80	120	555
Holmes	21	665	137	300	1102
Huron	23	920	189	.....	1109
Jackson	13	393	211	49	653
Jefferson	1	30	95	8	133
Knox	26	926	702	221	1849
Lake	.....	.....	59	.....	59
Lawrence	8	236	76	69	381
Licking	25	1010	191	372	1573
Logan	35	911	109	450	1470
Lorain	.....	.....	117	.....	117
Lucas	.....	.....	105	44	149
Madison	16	608	115	203	926
Mahoning	2	66	128	.....	194
Marion	20	690	16	.....	706
Medina	3	105	154	.....	259
Meigs	18	685	278	47	1010
Mercer	20	467	274	866	1607
Miami	32	921	58	320	1299
Monroe	20	710	450	124	1284
Montgomery	20	711	116	75	902
Morgan	20	929	256	32	1217
Morrow	31	1240	102	.....	1342
Muskingum	23	975	325	185	1485
Noble	27	1080	263	.....	1343
Ottawa	6	180	139	40	359
Paulding	11	568	205	45	818
Perry	17	666	171	119	956
Pickaway	15	534	8	765	1307
Pike	18	540	75	77	692
Portage	3	90	67	.....	157
Preble	31	925	143	270	1338
Putnam	36	1244	106	317	1667
Richland	27	825	586	.....	1411
Ross	19	510	301	194	1005
Sandusky	24	930	157	124	1087
Scioto	4	62	134	.....	320

TABLE 12.—Distribution of Farms on Basis of Methods of Assembling of Sour Cream or Butterfat—Continued

By counties, 1930

County	No. of cream stations	Farms selling through cream stations	Farms selling direct	Farms selling on truck routes	Total farms selling sour cream
Seneca	37	1280	501	.....	1781
Shelby	18	520	267	821	1608
Stark	7	210	189	.....	399
Summit	.....	.....	17	.....	17
Trumbull	2	60	84	.....	144
Tuscarawas	14	420	310	100	830
Union	24	750	9	112	871
Van Wert	19	949	211	129	1289
Vinton	10	400	133	74	607
Warren	9	252	34	350	636
Washington	17	595	386	390	1371
Wayne	13	450	208	.....	658
Williams	9	450	152	405	1007
Wood	21	950	210	1	1161
Wyandot	40	1575	64	.....	1639
Total	1502	53647	16232	16830	86709

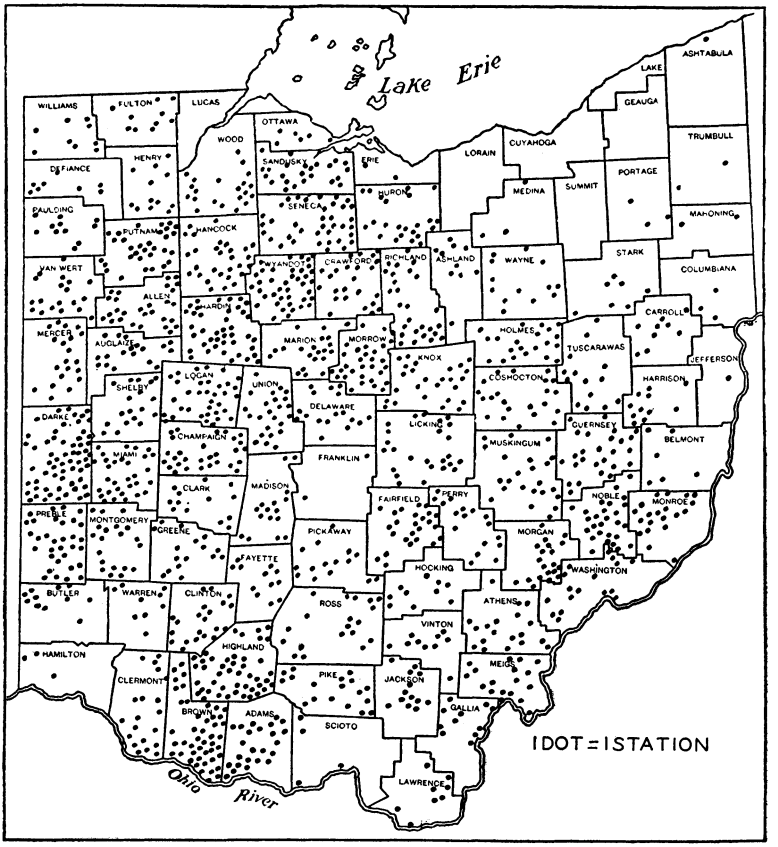

Fig. 4.—Cream stations recorded in 1931 survey

Direct deliveries to plants.—In the early history of butter manufacture by centralizing creameries much of the cream came in by rail shipment. In some instances it came long distances by parcel post. Farmers selling by this method are generally known as direct shippers. In addition to these shipments, much cream is delivered by the producer direct to the plant. Direct receipts by both these methods are combined in this report.

The distribution of farms whose cream goes direct to the factory is shown by counties in Table 12. The total for the State is 16,232, slightly less than one-third as many as were selling through cream stations.

Cream routes.—The expansion of hard-surfaced roads and the great increase in the use of motor trucks are bringing about a pronounced shift in methods of assembling cream. Small trucks go from farm to farm gathering cream and sometimes also eggs.

The cream routes offer several advantages over the cream stations. Cream routes tend to reduce the handling cost per pound of butterfat. This statement is substantiated by figures obtained from a concern operating both cream stations and cream routes. This reduction is accounted for as follows: (a) Truck routes eliminate the rent, light, heat, and salary expenses of maintaining a cream station; (b) the truck is becoming more efficient to operate each year; (c) one truck can gather as much cream in a week as three cream stations; (d) there is less handling of the cream on the truck route; and (e) the testing of the cream can be concentrated at the plant.

The second argument advanced for the sour cream truck route is that a better grade of cream is secured, thus making it possible to make better butter. The superior quality of the cream is due to the following reasons: (a) Less time is taken for the cream to go from the farm to the churn; (b) the cream is delivered oftener and more regularly to the plant; (c) the truck driver has a direct contact with both the plant and the producers, which places him in a position to act as an agent to improve the quality of the cream; and (d) the butter plants are in a better position to care for the cream than the cream stations.

Another point in favor of the truck is that it affords the aggressive manufacturer a greater opportunity to increase his cream purchases. His territory becomes more flexible. The operator does not have to wait for the producer to bring the cream to his station but may go to the farm and get it. This eliminates to some extent the shopping around that is done by the farmer in order to secure a better price for his cream. The truck saves the farmer the expense and inconvenience of bringing his cream to town.

The truck system of assembling cream has grown most rapidly in the west central and east central counties of Ohio. The total number of farms marketing by this method in 1931 was 16,830. This is only slightly higher than those going direct. The increase in shipments by truck comes very largely from the ranks of those who were marketing through cream stations. There was evidence that truck gathering of cream was due to increase to a marked degree.

SUMMARY AND CONCLUSIONS BASED ON THE SURVEY

1. A survey made by Prof. John W. Decker for the Ohio Dairymen's Association in 1903 showed 148 creameries, 77 skimming stations, 114 American cheese factories, 92 Swiss cheese factories, and 22 milk shipping stations. The 1931 survey revealed a great reduction in the number of creameries and

cheese factories, the elimination entirely of the skimming station, and the establishment of an extensive system of milk and cream trucking.

2. The population per farm under city inspection varies from 74.7 to 131.0 in the cities studied. This variation is due mainly to two factors—the amount of inspected milk going into uses other than fresh consumption and the average size of farm under inspection.

3. Cleveland inspection in May 1931 reached 46 of the 88 counties of Ohio. The total number of farms under inspection was 12,977, of which 542 were located in Pennsylvania. Including the population of Greater Cleveland, there were 92.2 persons for each farm under inspection.

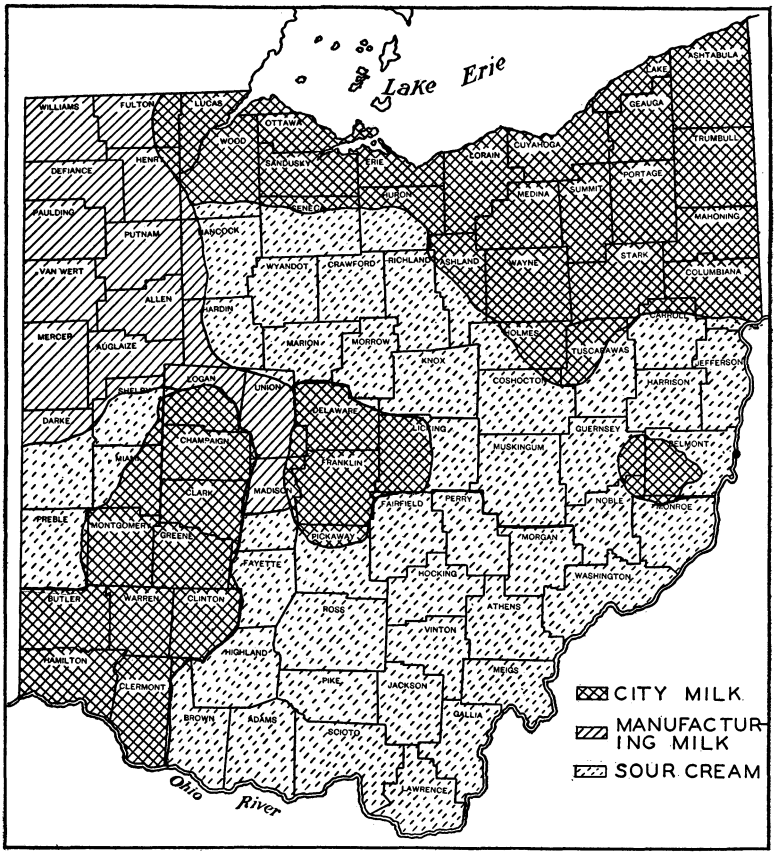

Fig. 5.—Predominance of market outlets by areas

4. It is becoming increasingly difficult to separate the farms selling fluid milk for fresh consumption from those selling for manufacture. Three of the large manufacturing plants are under the inspection of cities outside of Ohio, one of Chicago and two of Newark, New Jersey. Several of the most important manufacturing plants in Ohio are under inspection as reserve supplies for fresh milk requirements.

5. The Swiss cheese industry has gradually shrunk until it is confined to something less than 30 plants in the edges of the Cleveland, Pittsburgh, and Canton milk sheds. In 1931 it used approximately 38,000,000 pounds of milk and showed indications of moderate expansion.

6. The survey included the three types of agencies buying cream: (a) The large centralizer; (b) the small community creamery; and (c) the city milk plant engaged in the manufacture of some butter. With declining prices and relatively high transportation costs the small creamery located in heavy cream producing territory is shifting into a position of some advantage.

7. Farms totaling 86,709, selling sour cream, were classified on the basis of three methods of assembling: (a) Cream stations received the cream of 53,647 farms; (b) those selling direct totaled 16,232; and (c) truck routes gathered the cream from 16,830 farms. There were 1502 cream stations listed in the survey.

8. Sale of milk under city inspection predominates in northeastern and southwestern Ohio, that to manufacturing plants in northwestern Ohio, and to sour cream buyers in the central and southern counties.

In Figure 5 an attempt was made to draw rough boundary lines around the areas in which each of the three major outlets for milk dominated. The city milk areas obviously follow closely the lines of concentration of population. The small area in eastern Ohio lying largely in Belmont County represents the producers of a large milk condensery. They were put under inspection by Pittsburgh, but for the most part the product finds its way into manufactured channels.

CENSUS DATA ON SOURCES OF MILK AND BUTTERFAT

The study of census data was confined in the main to two lines of analysis: (a) Changes in the number of cows and heifers kept for milk by counties and districts between 1910 and 1930 and (b) the effects of changes in total population and its distribution upon the demand for milk for fluid consumption.

The analysis dealing with numbers of dairy cows is based upon a revision of the U. S. Census figures released by the Crop and Livestock Reporting Service of the United States Department of Agriculture in 1932. This revision extends back into all the years included in these analyses.

The district arrangement used by the Crop and Livestock Reporting Service has been followed to some extent in this census analysis. It happens that these divisions correspond quite closely to groupings of counties based upon market influences.

District No. 1, composed of 11 counties in the extreme northwest corner of the State, includes the most highly developed condensery industry in Ohio and the milk shed of Toledo insofar as Ohio is concerned.

District No. 2 includes 10 counties in the north central part of the State and represents in the main a territory that is gaining rapidly in importance as a part of the milk shed of Cleveland.

District No. 3 includes all of the old Western Reserve, excepting the counties of Erie, Huron, and Lorain, and in addition the three counties Wayne, Stark, and Columbiana. This represents what has always been the most intensive dairy producing area of Ohio.

District No. 4 includes nine counties in the west central part of the State and represents the heaviest sale of butterfat from farms.

District No. 5 comprises 12 counties in the center of the State with the city of Columbus located in almost the exact center of the district. It is dominated largely by the fluid milk demands of Columbus but also represents a fairly well developed milk manufacturing program and the sale of a considerable amount of butterfat.

District No. 6 is composed of seven counties in eastern Ohio much less intensive in dairy development than the Western Reserve counties just north of them. This district is distinguished by having the Swiss Cheese industry of Ohio located entirely within its borders.

District No. 7 is comprised of eight counties in southwestern Ohio and is dominated in the main by the fluid milk demands of Cincinnati and Hamilton.

District No. 8 extends along the Ohio River and includes eight counties in the south central part of the State. Its interests are mainly in sour cream.

District No. 9 comprises 12 counties in southeastern Ohio. Dairying is not highly developed in District 9, and the sale of butterfat is the main outlet for what production there is over local requirements[1].

CHANGES IN NUMBERS OF MILK COWS

The United States Census records the number of cows and heifers 2 years old and over kept mainly for milk production by counties. These numbers change from decade to decade to a considerable extent, due to such causes as growth of population, changes in type of farming, production cycles, and extension of improved highways.

The changes in milk cows by counties in census years 1910 to 1930 are given in Table 13. They are expressed both in terms of actual numbers of cows and in percentages.

The changes in numbers of cows between 1920 and 1930 are given by districts to convey something of their importance geographically.

The significant fact from a marketing viewpoint in these data is the heavy declines between 1920 and 1930 in the two districts which contain the greatest urban population; namely, District No. 3 around Cleveland and Akron and District No. 7 around Cincinnati and Dayton. The gains of 13 cows in District 2 and of 2381 in District 6 were not enough to offset the loss of 40,521 in District 3 from 1920 to 1930. The gains in District 4 alone, however, were about one and one-half times the losses in District 7.

An inverse relation between increasing density of population and number of milk cows is evident. This relationship is brought out in a striking manner when the counties containing cities of 100,000 or more population are brought together, as in Table 14. From a total of 114,236 milk cows in 1920 these counties dropped to 82,900 in 1930—a decline of 31,336, or 27.4 per cent, within this 10-year period.

The largest increase in number of cows was in Hancock County, with 3919. The next largest in number of cows was Wayne, with 3515. Madison County, with an increase of 2259 cows, had the highest percentage increase. It is significant that all of these counties are in the outer edges of city milk sheds. Districts 4, 5, and 7, in which sale of butterfat is of great importance, showed the most consistent gains as districts.

[1]For further detail than is given in the following analysis, see bulletin on Ohio Agricultural Statistics issued annually by the Ohio Agricultural Experiment Station, in cooperation with the U. S. Department of Agriculture.

TABLE 13.—Number of Cows and Heifers Two Years Old and Over Kept for Milk on Farms in Ohio

1910, 1920, and 1930

County	1910	1920	1930	Per cent change	
				1930 / 1910	1930 / 1920
Allen	9,191	10,043	10,000	8.8	— 0.4
Defiance	7,704	8,159	8,800	14.2	7.9
Fulton	14,851	15,895	13,100	—11.8	—17.6
Hancock	11,180	10,181	14,100	26.1	38.5
Henry	9,012	10,776	9,800	8.7	— 9.1
Lucas	8,745	7,773	4,200	—52.0	—46.0
Paulding	5,882	6,785	6,700	13.9	— 1.3
Putnam	10,276	10,155	11,400	10.9	12.3
Van Wert	7,597	8,339	9,100	19.8	9.1
Williams	10,361	10,903	11,400	10.0	4.6
Wood	11,379	12,328	13,300	16.9	7.9
District 1	106,178	111,337	111,900	5.4	0.5
Ashland	8,287	8,601	9,500	14.6	10.5
Crawford	8,458	9,010	9,400	11.1	4.3
Erie	5,009	6,142	5,700	13.8	— 7.2
Huron	8,298	9,532	10,000	20.5	4.9
Lorain	16,158	19,070	15,400	— 4.7	—19.2
Ottawa	5,802	6,219	6,000	3.4	— 3.5
Richland	11,037	12,308	11,800	6.9	— 4.1
Sandusky	8,711	9,150	10,500	20.5	14.8
Seneca	11,541	12,231	13,200	14.4	7.9
Wyandot	6,525	7,424	8,200	25.7	10.5
District 2	89,826	99,687	99,700	11.0	0.0
Ashtabula	23,465	25,148	21,800	— 7.1	—13.3
Columbiana	16,000	16,449	15,400	— 3.7	— 6.4
Cuyahoga	11,660	10,739	2,700	—76.8	—74.9
Geauga	15,830	16,960	10,900	—31.1	—35.7
Lake	5,539	6,044	2,900	—47.6	—52.0
Mahoning	12,783	14,290	11,900	— 6.9	—16.7
Medina	11,801	15,756	14,000	18.6	—11.1
Portage	15,498	18,714	15,800	1.9	—15.6
Stark	18,005	20,551	18,100	0.5	—11.9
Summit	13,543	13,440	7,800	—42.4	—42.0
Trumbull	20,687	22,445	15,200	—26.5	—32.3
Wayne	14,849	18,985	22,500	51.5	18.5
District 3	179,660	199,521	159,000	—11.5	—20.3
Auglaize	9,051	9,677	11,200	23.7	15.7
Champaign	7,453	10,649	12,800	71.7	20.2
Clark	9,625	11,560	12,200	26.8	5.5
Darke	14,663	16,972	18,100	23.4	6.6
Hardin	8,617	7,948	8,200	— 4.8	3.2
Logan	9,069	11,059	10,500	15.8	— 5.1
Mercer	10,208	9,050	12,400	21.5	37.0
Miami	9,142	11,388	13,000	42.2	14.2
Shelby	9,354	9,330	11,800	26.1	26.5
District 4	87,182	97,633	110,200	26.4	12.9
Delaware	12,486	13,171	14,200	13.7	7.8
Fairfield	9,157	11,411	11,500	25.6	0.8
Fayette	4,493	4,646	5,200	15.7	12.0
Franklin	15,053	16,676	15,000	— 0.4	—10.1
Knox	8,481	8,483	10,600	25.0	25.0
Licking	13,449	16,515	18,800	39.8	13.8
Madison	5,792	4,641	6,900	19.1	48.7
Marion	6,435	7,148	7,500	16.6	4.9
Morrow	7,599	8,632	8,800	15.8	1.9
Pickaway	7,103	6,301	7,700	8.4	22.2
Ross	6,571	7,552	6,700	2.0	—11.3
Union	9,613	11,700	11,600	20.7	— 0.9
District 5	106,232	116,876	124,500	17.2	6.5

TABLE 13.—Number of Cows and Heifers Two Years Old and Over Kept for Milk on Farms in Ohio—Continued

1910, 1920, and 1930

County	1910	1920	1930	Per cent change 1930/1910	Per cent change 1930/1920
Belmont	12,339	14,137	14,700	19.1	4.0
Carroll	7,020	7,458	7,000	— 0.3	— 6.1
Coshocton	8,202	8,129	9,200	12.2	13.2
Harrison	6,168	5,609	6,600	7.0	17.7
Holmes	10,349	11,377	12,200	17.9	7.2
Jefferson	7,193	6,910	6,800	— 5.5	— 1.6
Tuscarawas	12,586	13,699	13,200	4.9	— 3.6
District 6	63,857	67,319	69,700	9.2	3.5
Butler	9,913	13,000	12,800	29.1	— 1.5
Clermont	10,500	13,740	11,000	4.8	—19.9
Clinton	6,736	7,836	8,000	18.8	2.1
Greene	8,500	10,163	10,800	27.1	6.3
Hamilton	14,630	14,737	9,200	—37.1	—37.6
Montgomery	12,916	16,030	14,000	8.4	—12.7
Preble	8,562	9,899	10,900	27.3	10.1
Warren	8,764	10,786	10,900	24.4	1.1
District 7	80,521	96,191	87,600	8.8	— 8.9
Adams	6,059	7,638	8,200	35.3	7.4
Brown	8,214	11,102	10,500	27.8	— 5.4
Gallia	6,204	8,044	7,600	22.5	— 5.5
Highland	7,589	9,638	10,300	35.7	6.9
Jackson	4,580	4,540	4,500	— 1.7	— 0.9
Lawrence	5,446	5,895	5,700	4.7	— 3.7
Pike	3,339	3,361	3,600	7.8	7.1
Scioto	5,311	5,792	6,400	20.5	10.5
District 8	46,742	56,010	56,800	21.5	1.4
Athens	6,323	6,986	7,600	20.2	8.8
Guernsey	7,869	6,873	10,000	27.1	45.5
Hocking	4,462	4,392	3,700	—17.1	—15.8
Meigs	5,989	6,752	6,200	3.5	— 8.2
Monroe	9,290	9,711	9,200	— 1.0	— 5.3
Morgan	5,327	5,509	5,600	5.1	1.7
Muskingum	10,571	10,439	11,100	5.0	6.3
Noble	6,258	6,498	8,100	29.4	24.7
Perry	5,710	5,923	5,800	1.6	— 2.1
Vinton	3,530	2,738	2,800	—20.7	2.3
Washington	9,903	9,371	10,500	6.0	12.0
District 9	75,232	75,192	80,600	7.1	7.2
Ohio	835,430	919,766	900,000	7.7	— 2.1

TABLE 14.—Actual and Percentage Change in Number of Milk Cows in Counties with Cities of Over 100,000 Population, 1920-1930*

County	No. milk cows in 1930	No. milk cows in 1920	Change 1930 from 1920	Pct. change 1930 from 1920
Cuyahoga	2,700	10,739	— 8,039	—74.9
Franklin	15,000	16,676	— 1,676	—10.1
Hamilton	9,200	14,737	— 5,537	—37.6
Lucas	4,200	7,773	— 3,573	—46.0
Mahoning	11,900	14,290	— 2,390	—16.7
Montgomery	14,000	16,030	— 2,030	—12.7
Stark	18,100	20,551	— 2,451	—11.9
Summit	7,800	13,440	— 5,640	—42.0
Total	82,900	114,236	—31,336	—27.4

*Source—U. S. Census and Ohio Crop and Livestock Reporting Service.

It is also significant to know the distribution of cows with respect to acres of crop and pasture land. This determines the intensity of dairying in a given area. This relationship in terms of milk cows per hundred acres of crop and pasture land is shown by districts in Table 15. The slight changes here shown indicate that most of the changes in cows in a given area are associated with changes in the amount of land farmed and not with drastic changes in the intensity of dairying.

TABLE 15.—Dairy Cows per Hundred Acres of Crop and Pasture Land
By districts 1930, 1920, and 1910

District	No. per 100 acres 1930	No. per 100 acres 1920	Change 1930 from 1920	No. per 100 acres 1910	Change 1920 from 1910
District 1	4.3	4.5	−0.2	4.4	0.1
District 2	4.7	5.1	−0.4	4.4	0.7
District 3	7.2	9.2	−2.0	7.6	1.6
District 4	4.9	4.7	0.2	4.2	0.5
District 5	4.0	3.8	0.2	3.4	0.4
District 6	4.8	4.7	0.1	4.1	0.6
District 7	5.1	5.8	−0.7	4.7	1.1
District 8	3.5	3.5	0.0	2.9	0.6
District 9	3.4	3.4	0.0	3.4	0.0

The most striking change was in District 3 between 1920 and 1930. In addition to large areas taken over for suburban development there were also heavy losses in the testing for tuberculosis in this district. An analysis of the records of the State Department of Agriculture reveals that reactors in 1927 were 5.36 per cent of cows on farms January 1, 1927, 3.21 per cent in 1928, and 4.71 per cent in 1929[2] in the counties of the Western Reserve. No other district in Ohio approached this in losses from tuberculosis.

FARM SALES OF WHOLE MILK AND BUTTERFAT

The Census data on the sales of whole milk and of cream sold as butterfat are analyzed by counties and districts in Table 16.

District 3, comprising mainly the Western Reserve counties of northeastern Ohio, is well in the lead in the sales per farm reporting whole milk sold. Districts 2 and 6 have practically the same average, just under 4000 gallons per farm. Lorain County with an average of 5980 gallons, the highest in the State, from almost 8000 farms has a strong influence upon this district. District 6 is favorably influenced by the large sales per farm in Tuscarawas and Holmes Counties, the leading Swiss cheese counties.

District 1, which includes most of the condensery territory, has a low average annual sales per farm when compared with the areas dominated more completely by the fluid milk markets. It is very evident from this analysis that the farms with highest milk production almost invariably sell their product in the fluid milk markets.

In butterfat sales District 4 leads in number of farms and rates second in annual sales per farm. District 3 leads in sales per farm in butterfat as well as milk, but the small number of farms selling butterfat is significant. Districts 4, 5, 8, and 9 comprise the areas most generally regarded as the dominant sour cream areas.

[2]For further details see Ohio Experiment Station Bulletin 469, "Market Milk Areas in Northeastern Ohio", pp. 31-33.

TABLE 16.—Sales of Whole Milk and Butterfat and Number of Farms Reporting Each

By counties and districts, 1929

	Whole milk sold 1929	Farms reporting whole milk sold	Annual sales of whole milk per farm reporting	Cream sold as butterfat	Farms reporting cream sold as butterfat	Annual sales of butterfat per farm
	1000 gallons	*Number*	*Gallons*	*1000 pounds*	*Number*	*Pounds*
District 1:						
Allen	1,392	663	2,101	724	1,371	528
Defiance	2,407	973	2,474	503	745	675
Fulton	5,937	1,747	3,398	441	544	811
Hancock	2,235	839	2,664	1,138	1,663	684
Henry	2,916	1,360	2,144	483	846	571
Lucas	1,517	506	2,998	89	197	452
Paulding	1,643	707	2,324	402	733	548
Putnam	1,707	908	1,880	793	1,486	534
Van Wert	1,473	648	2,273	653	1,375	475
Williams	2,843	999	2,846	860	1,177	731
Wood	4,157	1,512	2,749	503	1,124	448
Total	28,227	10,862	2,599	6,589	11,261	585
District 2:						
Ashland	1,933	521	3,710	554	1,178	470
Crawford	829	241	3,440	960	1,528	628
Erie	1,664	342	4,865	270	436	619
Huron	2,269	572	3,967	517	1,122	461
Lorain	7,983	1,335	5,980	83	139	597
Ottawa	1,799	778	2,312	154	401	384
Richland	1,856	580	3,200	819	1,437	570
Sandusky	2,185	701	3,117	598	1,249	479
Seneca	1,400	398	3,518	1,220	1,974	618
Wyandot	397	140	2,836	927	1,589	583
Total	22,315	5,608	3,979	6,102	11,053	552
District 3:						
Ashtabula	10,271	1,974	5,204	143	186	769
Columbiana	5,354	1,232	4,346	343	427	806
Cuyahoga	1,227	274	4,478	10	22	455
Geauga	5,992	1,077	5,564	14	25	560
Lake	1,153	269	4,286	12	25	480
Mahoning	4,727	1,122	4,213	169	196	862
Medina	7,199	1,410	5,106	160	260	615
Portage	8,010	1,518	5,277	79	141	560
Stark	8,356	1,633	5,117	230	359	641
Summit	3,862	745	5,184	29	35	829
Trumbull	8,296	1,572	5,277	49	68	721
Wayne	10,155	1,787	5,683	565	859	658
Total	74,602	14,613	5,105	1,803	2,603	693
District 4:						
Auglaize	1,417	628	2,256	1,004	1,432	701
Champaign	3,564	1,035	3,444	625	777	804
Clark	4,618	1,042	4,432	435	552	788
Darke	1,589	871	1,824	1,790	3,163	566
Hardin	1,192	529	2,253	601	1,273	472
Logan	1,811	702	2,580	798	1,228	650
Mercer	1,651	903	1,828	911	1,582	576
Miami	2,804	927	3,025	830	1,307	635
Shelby	1,086	424	2,561	1,222	1,619	755
Total	19,732	7,061	2,795	8,216	12,933	635
District 5:						
Delaware	5,544	1,579	3,511	267	419	637
Fairfield	1,292	415	3,113	1,028	1,830	562
Fayette	768	437	1,757	276	685	403
Franklin	5,478	1,113	4,922	434	524	828
Knox	695	195	3,564	1,212	1,932	627
Licking	5,051	1,281	3,943	809	1,324	611
Madison	1,303	475	2,743	294	603	488
Marion	1,578	687	2,297	358	697	514
Morrow	614	262	2,344	861	1,531	562
Pickaway	1,025	437	2,346	522	1,018	513
Ross	754	288	2,618	385	945	407
Union	3,832	1,380	2,777	342	607	563
Total	27,934	8,549	3,268	6,788	12,115	560

TABLE 16.—Sales of Whole Milk and Butterfat and Number of Farms Reporting Each —Continued

By counties and districts, 1929

	Whole milk sold 1929	Farms reporting whole milk sold	Annual sales of whole milk per farm reporting	Cream sold as butterfat	Farms reporting cream sold as butterfat	Annual sales of butterfat per farm
	1000 gallons	*Number*	*Gallons*	*1000 pounds*	*Number*	*Pounds*
District 6:						
Belmont	3,668	998	3,675	436	691	631
Carroll	868	358	2,425	559	956	585
Coshocton	904	253	3,573	734	1,481	496
Harrison	872	312	2,795	367	747	491
Holmes	3,438	842	4,083	695	1,213	573
Jefferson	1,921	526	3,654	96	161	596
Tuscarawas	4,627	833	5,555	415	755	550
Total	16,298	4,122	3,954	3,302	6,004	550
District 7:						
Butler	4,817	1,341	3,592	249	352	707
Clermont	1,655	606	2,731	757	1,576	480
Clinton	1,408	610	2,308	467	1,057	442
Greene	3,627	1,222	2,968	275	501	549
Hamilton	3,905	692	5,643	160	296	541
Montgomery	4,397	1,505	2,922	356	661	538
Preble	2,223	895	2,484	751	1,312	572
Warren	3,603	1,104	3,264	302	551	548
Total	25,635	7,975	3,214	3,317	6,306	526
District 8:						
Adams	408	278	1,468	695	1,619	429
Brown	345	242	1,426	1,052	2,298	458
Gallia	734	198	3,712	476	1,525	312
Highland	846	395	2,142	719	1,902	378
Jackson	295	139	2,122	269	705	382
Lawrence	769	329	2,337	146	406	360
Pike	273	96	2,844	233	690	338
Scioto	1,572	418	3,761	173	366	473
Total	5,242	2,095	2,502	3,763	9,511	396
District 9:						
Athens	1,230	388	3,170	382	851	449
Guernsey	1,188	410	2,898	619	1,243	498
Hocking	198	87	2,276	315	695	453
Meigs	466	236	1,975	426	1,134	376
Monroe	634	267	2,375	748	1,526	490
Morgan	243	151	1,609	466	1,224	381
Muskingum	1,469	522	2,814	760	1,332	571
Noble	304	146	2,082	764	1,667	458
Perry	429	242	1,773	513	865	593
Vinton	68	62	1,097	217	609	356
Washington	937	408	2,297	593	1,443	411
Total	7,166	2,919	2,455	5,803	12,589	461
State	227,151	63,804	3,560	45,683	84,375	541

POPULATION AND MILK REQUIREMENTS

The marketing of whole milk is influenced greatly by the degree of concentration of population. This section of the analysis consists of a study of the concentration of population in urban centers and its relation to sales of whole milk.

The population census of 1930 and 1920 makes a classification of farm and non-farm. An estimate on the same basis has been prepared for 1910. For practical purposes the non-farm population may be regarded as milk purchasers and the farm population as having their milk requirements provided before any goes to market.

The farm classification given below in Table 17 includes urban farm population with rural farm. Urban farm includes those who live on farms within the corporate limits of towns and cities over 2500. For 1930 the State total of urban farm population was 9,241, and for 1920 it was 5,417. No estimate was made for 1910.

TABLE 17.—Population of Ohio, Farm and Non-farm, 1910 to 1930*

Class	1930 (Apr. 1)	1920 (Jan. 1)	1910 (Apr. 15)
Total	6,646,697	5,759,394	4,767,121
Farm	1,013,529	1,139,329	1,244,769
Rural farm	1,004,288	1,133,912	.....
Urban farm	9,241	5,417	.....
Non-farm	5,633,168	4,620,065	3,522,352
Per cent farm	15.2	19.8	26.1
Per cent non-farm	84.8	80.2	73.9

*Source—U. S. Census, Ohio Population Bulletin, Second Series.

The milk purchasing population by counties was computed by the following method. From the total population of the county the rural farm figure was subtracted. There are a few persons in each county living on farms within the corporate limits of cities over 2500 in population. These are called urban farm population. These were not added to the rural farm population before making the subtraction because it was assumed that it in most cases these would be truck or poultry farms and that these people would look to other farms for their milk requirements. The remainder after the rural farm was subtracted from the total population was designated as the milk purchasing population. This is given by counties and districts in Table 18.

Concentration in cities of over 10,000 population.—When cities reach a size of 10,000 or more the handling of milk tends to pass largely into city milk plants and problems of transportation, board of health inspection, and others of such character arise. In Table 19 is shown the extent of concentration of population in such cities by districts. District 3 with Cleveland, Akron, Youngstown, Canton, and smaller cities surrounding them represents by far the most concentrated area of population in Ohio. This one district in 1930 contained 48.7 per cent of the people in Ohio, who lived in cities with over 10,000 population. District 7, including Cincinnati and Dayton, was second in importance with 19.9 per cent and District 5, with Columbus as the largest city, was third, with 9.9 per cent of the large city population. The three districts combined include 78.5 per cent of this highly concentrated population.

The increase of population in cities over 10,000 was very much more rapid in District 3 than in any other of the nine as is shown in Table 20.

It is significant that the increase in population was much more rapid in these larger towns and cities than in the State as a whole. The population in the group of cities as a whole in 1930 was 233.5 per cent that of 1900; whereas that of the State, including all classifications rural and urban, was only 159.8 per cent.

The degree to which this city population has been concentrating in the 12 counties of northeastern Ohio is shown in Table 21 which distributes the total for each decade into districts on a percentage basis. District 3 in 1900 contained 35.7 per cent of this concentrated population; in 1930 it contained 48.7 per cent of it. District 7 stands out in sharp contrast with a decline from 27.4 per cent to 19.9 per cent.

TABLE 18.—Milk Purchasing Population by Counties and Extent of Concentration in Cities Over 10,000 in 1930

County	Total population	Rural farm population	Population in cities over 10,000	Milk purchasing population exclusive of cities over 10,000	Total milk purchasing population
District 1:					
Allen	69,419	11,959	42,287	15,173	57,460
Defiance	22,714	9,156	.....	13,558	13,558
Fulton	23,477	12,890	.....	10,587	10,587
Hancock	40,404	13,440	21,512	5,452	26,964
Henry	22,524	11,627	.....	10,897	10,897
Lucas	347,709	11,116	290,718	45,875	336,593
Paulding	15,301	8,546	.....	6,755	6,755
Putnam	25,074	14,319	.....	10,755	10,755
Van Wert	26,273	10,945	.....	15,328	15,328
Williams	24,316	10,690	.....	13,626	13,626
Wood	50,320	17,517	.....	32,803	32,803
Total	667,531	132,205	354,517	180,809	535,326
District 2:					
Ashland	26,867	9,196	11,141	6,530	17,671
Crawford	35,345	9,663	10,027	15,655	25,682
Erie	42,133	7,098	24,622	10,413	35,035
Huron	33,700	10,551	.....	23,149	23,149
Lorain	109,206	13,822	70,145	25,239	95,384
Ottawa	24,109	8,901	.....	15,208	15,208
Richland	65,902	12,560	33,525	19,817	53,342
Sandusky	39,731	12,000	13,422	14,309	27,731
Seneca	47,941	14,031	27,069	6,841	33,910
Wyandot	19,036	8,970	.....	10,066	10,066
Total	443,970	106,792	189,951	147,227	337,178
District 3:					
Ashtabula	68,361	18,033	23,301	27,027	50,328
Columbiana	86,484	14,846	33,951	37,687	71,638
Cuyahoga	1,201,455	6,161	1,121,572	73,722	1,195,294
Geauga	15,414	8,932	.....	6,482	6,482
Lake	41,674	5,445	10,944	25,285	36,229
Mahoning	236,142	10,921	195,924	29,297	225,221
Medina	29,677	11,274	.....	18,403	18,403
Portage	42,682	13,701	.....	28,981	28,981
Stark	221,784	16,672	154,353	50,759	205,112
Summit	344,131	8,671	298,771	36,689	335,460
Trumbull	123,063	14,709	57,376	50,978	108,354
Wayne	47,024	17,356	10,742	18,926	29,668
Total	2,457,891	146,721	1,906,934	404,236	2,311,170
District 4:					
Auglaize	28,034	11,165	.....	16,869	16,869
Champaign	24,103	9,725	.....	14,378	14,378
Clark	90,936	11,054	68,743	11,139	79,882
Darke	38,009	20,475	.....	17,534	17,534
Hardin	27,635	12,374	.....	15,261	15,261
Logan	28,981	10,679	.....	18,302	18,302
Mercer	25,096	13,351	.....	11,745	11,745
Miami	51,301	13,139	16,009	22,153	38,162
Shelby	24,924	10,375	.....	14,549	14,549
Total	339,019	112,337	84,752	141,930	226,682
District 5:					
Delaware	26,016	11,317	.....	14,699	14,699
Fairfield	44,010	14,696	18,716	10,598	29,314
Fayette	20,755	9,054	.....	11,701	11,701
Franklin	361,055	14,451	290,564	56,040	346,604
Knox	29,338	10,460	.....	18,878	18,878
Licking	59,962	15,881	30,596	13,485	44,081
Madison	20,253	8,568	.....	11,685	11,685
Marion	45,420	8,042	31,084	6,294	37,378
Morrow	14,489	9,400	.....	5,089	5,089
Pickaway	27,238	11,900	.....	15,338	15,338
Ross	45,181	14,905	18,340	11,936	30,276
Union	19,192	9,824	.....	9,368	9,368
Total	712,909	138,498	389,300	185,111	574,411

TABLE 18.—Milk Purchasing Population by Counties and Extent of Concentration in Cities Over 10,000 in 1930—Continued

County	Total population	Rural farm population	Population in cities over 10,000	Milk purchasing population exclusive of cities over 10,000	Total milk purchasing population
District 6:					
Belmont	94,719	16,350	27,851	50,518	78,369
Carroll	16,057	7,403	.....	8,654	8,654
Coshocton	28,976	10,664	10,908	7,404	18,312
Harrison	18,844	6,992	.....	11,852	11,852
Holmes	16,726	10,353	.....	6,373	6,373
Jefferson	88,307	7,899	35,422	44,986	80,408
Tuscarawas	68,193	12,390	12,365	43,438	55,803
Total	331,822	72,051	86,546	173,225	259,771
District 7:					
Butler	114,084	11,760	82,168	20,156	102,324
Clermont	29,786	13,435	.....	16,351	16,351
Clinton	21,547	8,908	.....	12,639	12,639
Greene	33,259	10,166	10,507	12,586	23,093
Hamilton	589,356	10,832	484,571	93,953	578,524
Montgomery	273,481	16,667	200,982	55,832	256,814
Preble	22,455	11,817	.....	10,638	10,638
Warren	27,348	10,316	.....	17,032	17,032
Total	1,111,316	93,901	778,228	239,187	1,017,415
District 8:					
Adams	20,381	12,999	.....	7,382	7,382
Brown	20,148	12,857	.....	7,291	7,291
Gallia	23,050	12,087	.....	10,963	10,963
Highland	25,416	12,332	.....	13,084	13,084
Jackson	25,040	7,812	.....	17,228	17,228
Lawrence	44,541	12,824	16,621	15,096	31,717
Pike	13,876	8,919	.....	4,957	4,957
Scioto	81,221	13,427	42,560	25,234	67,794
Total	253,673	93,257	59,181	101,235	160,416
District 9:					
Athens	44,175	8,689	.....	35,486	35,486
Guernsey	41,486	10,710	16,129	14,647	30,776
Hocking	20,407	6,772	.....	13,635	13,635
Meigs	23,961	9,743	.....	14,218	14,218
Monroe	18,426	11,730	.....	6,696	6,696
Morgan	13,583	8,372	.....	5,211	5,211
Muskingum	67,398	13,116	36,440	17,842	54,282
Noble	14,961	9,198	.....	5,763	5,763
Perry	31,445	8,941	.....	22,504	22,504
Vinton	10,287	5,399	.....	4,888	4,888
Washington	42,437	15,856	14,285	12,296	26,681
Total	328,566	108,526	66,854	153,186	220,040
State	6,646,697	1,004,288	3,916,263	1,726,146	5,642,409

TABLE 19.—Population of Cities Over 10,000 in 1930

By districts, 1900—1930

City	1930	1920	1910	1900
Findlay	19,363	17,021	14,858	17,613
Fostoria	2,149	1,658	1,545	1,340
Lima	42,287	41,326	30,508	21,723
Toledo	290,718	243,164	168,497	131,822
District 1 Total	354,517	303,169	215,408	172,498
Ashland	11,141	9,249	6,795	4,087
Bucyrus	10,027	10,425	8,122	6,560
Elyria	25,633	20,474	14,825	8,791
Fostoria	10,641	8,329	8,052	6,390
Fremont	13,422	12,468	9,939	8,439
Lorain	44,512	37,295	28,883	16,028
Mansfield	33,525	27,824	20,768	17,640
Sandusky	24,622	22,897	19,989	19,664
Tiffin	16,428	14,375	11,894	10,989
District 2 Total	189,951	163,336	129,267	98,588
Akron	255,040	208,435	69,067	42,728
Alliance	23,047	21,603	15,083	8,974
Ashtabula	23,301	22,082	18,266	12,949
Barberton	23,934	18,811	9,410	4,354
Campbell	14,673	11,237	4,972	.....
Canton	104,906	87,091	50,217	30,667
Cleveland	900,429	796,841	560,663	381,768
Cleveland Heights	50,945	15,236	2,955	.....
Cuyahoga Falls	19,797	10,200	4,020	3,186
East Cleveland	39,667	27,292	9,179	2,757
East Liverpool	23,329	21,411	20,387	16,485
Euclid	12,751	3,363	1,953	.....
Garfield Heights	15,589	2,550	.....	.....
Lakewood	70,509	41,732	15,181	3,355
Massillon	26,400	17,428	13,879	11,944
Niles	16,314	13,080	8,361	7,468
Painesville	10,944	7,272	5,501	5,024
Parma	13,899	.....	.....	.....
Salem	10,622	10,305	8,943	7,582
Shaker Heights	17,783	1,616	.....	.....
Struthers	11,249	5,847	3,370	.....
Warren	41,062	27,050	11,081	8,529
Wooster	10,742	8,204	6,136	6,063
Youngstown	170,002	132,358	79,066	44,885
District 3 Total	1,906,934	1,511,044	917,690	598,718
Piqua	16,009	15,044	13,388	12,172
Springfield	68,743	60,840	46,921	38,253
District 4 Total	84,752	75,884	60,309	50,425
Chillicothe	18,340	15,831	14,508	12,976
Columbus	290,564	237,031	181,511	125,560
Lancaster	18,716	14,706	13,093	8,991
Marion	31,084	27,891	18,232	11,862
Newark	30,596	26,718	25,404	18,157
District 5 Total	389,300	322,177	252,748	177,546
Bellaire	13,327	15,061	12,946	9,912
Coshocton	10,908	10,847	9,603	6,473
Martins Ferry	14,524	11,634	9,133	7,760
New Philadelphia	12,365	10,718	8,542	6,213
Steubenville	35,422	28,508	22,391	14,349
District 6 Total	86,546	76,768	62,615	44,707
Cincinnati	451,160	401,247	363,591	325,902
Dayton	200,982	152,559	116,577	85,333
Hamilton	52,176	39,675	35,279	23,914
Middletown	29,993	23,594	13,152	9,215
Norwood	33,411	24,966	16,185	6,480
Xenia	10,507	9,110	8,706	8,696
District 7 Total	778,228	651,151	571,490	459,540

TABLE 19.—Population of Cities Over 10,000 in 1930—Continued

By districts, 1900-1930

City	1930	1920	1910	1900
Ironton	16,621	14,007	13,147	11,868
Portsmouth	42,560	33,011	23,481	17,870
District 8 Total	59,181	47,018	36,628	29,738
Cambridge	16,129	13,104	11,327	8,241
Marietta	14,285	15,140	12,923	13,348
Zanesville	36,440	29,569	28,026	23,538
District 9 Total	66,854	57,813	52,276	45,127
Grand Total	3,916,263	3,208,360	2,280,431	1,676,887
Population of Ohio	6,646,697	5,759,394	4,767,121	4,157,545

TABLE 20.—Relative Changes in Population in Towns with Over 10,000 in 1930

By districts. 1900 = 100%

District	1930 % of 1900	1920 % of 1900	1910 % of 1900	1900
1	205.5	175.8	124.8	100
2	192.7	165.7	131.1	100
3	318.5	252.4	153.3	100
4	168.1	150.5	119.6	100
5	218.7	181.5	142.4	100
6	193.5	171.7	140.1	100
7	169.3	141.7	124.4	100
8	199.0	158.1	123.1	100
9	148.1	128.1	115.8	100
All cities over 10,000	233.5	191.3	136.0	100
State of Ohio	159.8	138.5	114.7	100

TABLE 21.—Percentage Distribution of Population in Cities Over 10,000 in 1930

By decades, 1900 to 1930

District	1930	1920	1910	1900
1	9.1	9.4	9.4	10.3
2	4.8	5.1	5.7	5.9
3	48.7	47.1	40.2	35.7
4	2.2	2.4	2.6	3.0
5	9.9	10.0	11.1	10.6
6	2.2	2.4	2.7	2.7
7	19.9	20.3	25.1	27.4
8	1.5	1.5	1.6	1.8
9	1.7	1.8	2.3	2.7

TABLE 22.—Relation of Farms Selling Whole Milk to Fluid Milk Requirements of Milk Purchasing Population

By counties, 1929*

County	Rural farm population	Milk purchasing population	Needed to meet local requirements in November		Farms reporting whole milk sold	
			Gallons	Farms	Total	Relation to local needs
Adams	12,999	7,382	642	185	278	+ 93
Allen	11,959	57,460	4,996	1,024	663	— 361
Ashland	9,196	17,671	1,537	178	521	+ 343
Ashtabula	18,033	50,328	4,376	362	1,974	+1,612
Athens	8,689	35,486	3,086	419	388	— 31
Auglaize	11,165	16,869	1,467	280	628	+ 348
Belmont	16,350	78,369	6,815	798	998	+ 200
Brown	12,857	7,291	634	191	242	+ 51
Butler	11,760	102,324	8,898	1,066	1,341	+ 275
Carroll	7,403	8,654	752	134	358	+ 224
Champaign	9,725	14,378	1,250	156	1,035	+ 879
Clark	11,054	79,882	6,946	675	1,042	+ 367
Clermont	13,435	16,351	1,422	224	606	+ 382
Clinton	8,908	12,639	1,099	205	610	+ 405
Columbiana	14,846	71,638	6,229	617	1,232	+ 615
Coshocton	10,664	18,312	1,592	192	253	+ 61
Crawford	9,663	25,682	2,233	279	241	— 38
Cuyahoga	6,161	1,195,294	103,939	9,993	274	—9,719
Darke	20,475	17,534	1,525	360	871	+ 511
Defiance	9,156	13,558	1,179	205	973	+ 768
Delaware	11,317	14,699	1,278	157	1,579	+1,422
Erie	7,098	35,035	3,046	270	342	+ 72
Fairfield	14,696	29,314	2,549	352	415	+ 63
Fayette	9,054	11,701	1,018	249	437	+ 188
Franklin	14,451	346,604	30,140	2,636	1,113	—1,523
Fulton	12,890	10,587	921	117	1,747	+1,630
Gallia	12,087	10,963	953	111	198	+ 87
Geauga	8,932	6,482	570	44	1,077	+1,033
Greene	10,166	23,093	2,008	291	1,222	+ 931
Guernsey	10,710	30,776	2,676	398	410	+ 12
Hamilton	10,832	578,524	50,306	3,838	692	—3,146
Hancock	13,440	26,964	2,345	379	839	+ 460
Hardin	12,374	15,261	1,327	254	529	+ 275
Harrison	6,992	11,852	1,031	159	312	+ 153
Henry	11,627	10,897	948	190	1,360	+1,170
Highland	12,332	13,084	1,138	229	395	+ 166
Hocking	6,772	13,635	1,186	225	87	— 138
Holmes	10,353	6,373	554	58	842	+ 784
Huron	10,551	23,149	2,013	274	572	+ 298
Jackson	7,812	17,228	1,498	304	139	— 165
Jefferson	7,899	80,408	6,992	824	526	— 298
Knox	10,460	18,878	1,642	198	195	— 3
Lake	5,445	36,229	3,150	316	269	— 47
Lawrence	12,824	31,717	2,758	508	329	— 179
Licking	15,881	44,081	3,833	418	1,281	+ 863
Logan	10,679	18,302	1,592	266	702	+ 436
Lorain	13,822	95,384	8,294	597	1,335	+ 738
Lucas	11,116	336,593	29,269	4,202	506	—3,696
Madison	8,568	11,685	1,016	160	475	+ 315
Mahoning	10,921	225,221	19,584	2,001	1,122	— 879
Marion	8,042	37,378	3,250	609	687	+ 78
Medina	11,274	18,403	1,600	135	1,410	+1,275
Meigs	9,743	14,218	1,236	269	236	— 33
Mercer	13,351	11,745	1,021	240	903	+ 663
Miami	13,139	38,162	3,318	472	927	+ 455
Monroe	11,730	6,696	582	106	267	+ 161
Montgomery	16,667	256,814	22,332	3,290	1,505	—1,785
Morgan	8,372	5,211	453	121	151	+ 30
Morrow	9,400	5,089	442	81	262	+ 181
Muskingum	13,116	54,282	4,720	722	522	— 200
Noble	9,198	5,763	501	104	146	+ 42
Ottawa	8,901	15,208	1,322	246	778	+ 532
Paulding	8,546	6,755	587	109	707	+ 598
Perry	8,941	22,504	1,957	476	242	— 234
Pickaway	11,900	15,338	1,334	345	437	+ 92
Pike	8,919	4,957	431	65	96	+ 31
Portage	13,701	28,981	2,520	206	1,518	+1,312
Preble	11,817	10,638	925	160	895	+ 735
Putnam	14,319	10,755	935	214	908	+ 694

*Source—U. S. Census.

Relation of whole milk sales to consumer requirements, by counties.—The census contains data on the number of farms selling whole milk and the quantity sold in 1929. From this it is possible to obtain for each county the average sales per farm on an annual basis.

In measuring the fluid milk requirements, annual sales cannot be matched against total consumer needs because of the marked seasonal variation of sales, which does not correspond with the month to month market requirements for fluid milk. In order to calculate the number of farms required to meet a given demand, it is necessary to know the average daily sales of the lowest period of production, which in Ohio is the month of November.

From dealer receipts in a large number of markets, scattered widely over Ohio, a norm of seasonal variation was computed. By means of this seasonal relative, the November requirements are calculated from annual figures and are given by counties in Table 22.

TABLE 22.—Relation of Farms Selling Whole Milk to Fluid Milk Requirements of Milk Purchasing Population—Continued

By counties, 1929*

County	Rural farm population	Milk purchasing population	Needed to meet local requirements in November		Farms reporting whole milk sold	
			Gallons	Farms	Total	Relation to local needs
Richland	12,560	53,342	4,638	624	580	— 44
Ross	14,905	30,276	2,633	433	288	— 145
Sandusky	12,000	27,731	2,411	333	701	+ 368
Scioto	13,427	67,794	5,895	675	418	— 257
Seneca	14,031	33,910	2,949	361	398	+ 37
Shelby	10,375	14,549	1,265	213	424	+ 211
Stark	16,672	205,112	17,836	1,500	1,633	+ 133
Summit	8,671	335,460	29,170	2,422	745	— 1,677
Trumbull	14,709	108,354	9,422	768	1,572	+ 804
Tuscarawas	12,390	55,803	4,852	376	833	+ 457
Union	9,824	9,368	815	126	1,380	+ 1,254
Van Wert	10,945	15,328	1,333	252	648	+ 396
Vinton	5,399	4,888	425	168	62	— 106
Warren	10,316	17,032	1,481	195	1,104	+ 909
Washington	15,856	26,581	2,311	433	408	— 25
Wayne	17,356	29,668	2,580	195	1,787	+ 1,592
Williams	10,690	13,626	1,185	179	999	+ 820
Wood	17,517	32,803	2,852	447	1,512	+ 1,065
Wyandot	8,970	10,066	875	133	140	+ 7
Total farms excess						+33,162
Total farms deficit						—24,729
Net farms excess						+ 8,433
Total	1,004,288	5,642,409	490,646	55,371	63,804	

*Source—U. S. Census.

Milk requirements were set at three-fourths pound per day per capita. This is based on estimates for Ohio markets during 1925 to 1930.

The relation of whole milk sales to local, fluid milk requirements in terms of farms needed to supply them are given in Table 22. It is important to keep in mind that these figures are in terms of the average sales per day of farms for each county. Cuyahoga County, for example, is short 9,719 farms of the size found in that county. These farms are lower in average sales than those of Geauga and Lorain but higher than those of Ashland and Crawford Counties. For this reason this analysis was not worked out on the district basis.

The net balance of farms selling whole milk and farms needed to meet milk purchasing requirements is very close. The summary shows an excess of only 9,243 farms. This does not indicate that all farms except 9,000 in Ohio that sell whole milk sell it to a fluid milk market.

The number of farms outside of the State selling to markets within the State now exceeds the number of Ohio farms selling to markets outside the State. The figures on daily requirements per capita are based on the larger cities, and it is probable that the requirements are lower in many of the smaller markets.

When the counties are arranged in two groups, those with an excess of farms reporting whole milk sold and those with a deficit, there are 64 in which local requirements are more than met and 24 in which farms reporting whole milk sold fall short of estimated local requirements.

SUMMARY AND CONCLUSIONS ON CENSUS DATA

1. The study combines an analysis of census data with a survey of the sources of milk and butterfat marketed in Ohio. The census analysis deals with changes in numbers of dairy cows and relation of population to demands for fluid milk.

2. Changes in number of milk cows occurring between 1920 and 1930 are most significant. Losses were heaviest near large centers of population. District 3 of the Crop Reporting Service (comprising about half of the Cleveland milk shed) lost 40,521 cows, or over 20 per cent in this period. The two adjacent districts showed gains of only 2394 cows in the same period, leaving northeastern Ohio with a net loss of over 38,000 milk cows. District 7, in which Cincinnati is located, also lost in dairy cows but the gains in adjacent districts more than offset these losses.

3. Sales of milk per farm ran highest in the counties supplying fluid milk to Cleveland. Sales to cheese factories were next in order, and then those selling to manufacturing plants. The butterfat farms rank lowest in sales of product per farm.

4. When cities reach a size of 10,000 or more, the handling of milk passes largely into the hands of milk dealers with pasteurizing plants in the cities. The increasing importance of this type of milk merchandising is indicated by the fact that population in cities over 10,000 in 1930 was 233.5 per cent of 1900; whereas the State as a whole was only 159.8 per cent of 1900.

5. When the needs of the local population were estimated on the basis of three-fourths pound per day per capita, it was found that whole milk sales in 64 counties exceeded the local demands. In 24 counties the whole milk sales were not enough to meet the local needs, as it was necessary to depend upon importations from other counties.